

**REMARKS****Summary of the Office Action**

Claims 1, 2, 5, 7-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Okuno et al. (US 6,265,262) in view of Yang et al. (US 2002/0022334 A1), Iizuka (US 6,338,996 B1), Lou (US 6,143,605), and Tsu et al. (US 6,294,420).

Claims 3, 4, and 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Okuno et al. in view of Yang et al., Iizuka, Lou, Tsu et al., and Graettinger et al. (US 6,348,709 B1).

**Summary of the Response to the Office Action**

Applicant has canceled claim 13, amended claims 1, 8, and 14, and added new claims 17-20 to further define the invention. Accordingly, claims 1-12 and 14-20 are pending for further consideration.

**All Claims Define Allowable Subject Matter**

Claims 1, 2, 5, 7-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Okuno et al. (US 6,265,262) in view of Yang et al. (US 2002/0022334 A1), Iizuka (US 6,338,996 B1), Lou (US 6,143,605), and Tsu et al. (US 6,294,420), and claims 3, 4, and 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Okuno et al. in view of Yang et al., Iizuka, Lou, Tsu et al., and Graettinger et al. (US 6,348,709 B1). Applicant traverses these rejections for at least the following reasons.

Without conceding the appropriateness of the above rejections, but to advance prosecution of the present application, Applicant has amended independent claim 1 to recite steps of: "forming a Ruthenium lower electrode on said internal wall of said concave hole,"

“performing a  $\text{NH}_3$ -plasma process and a  $\text{N}_2\text{O}$ -plasma process sequentially on said Ruthenium lower electrode,” “forming a BST dielectric film on said Ruthenium lower electrode which had undergone said  $\text{NH}_3$ -plasma process and said  $\text{N}_2\text{O}$ -plasma process,” “crystallizing said BST dielectric film, said crystallizing including performing a rapid thermal process,” and “forming an upper electrode on said BST dielectric film, said BST dielectric film, said lower Ruthenium electrode and said upper electrode forming said capacitor.”

With regard to independent claim 1, the Office Action admits that “the combination of Okuno et al. and Lou do not disclose performing  $\text{NH}_3$  plasma process and  $\text{N}_2\text{O}$  plasma process prior to depositing BST dielectric film.” Moreover, the Office Action admits that “[t]he combination process does not disclose that the nitridation process is performed using a  $\text{NH}_3$  plasma process,” although Yang et al. does apparently disclose steps of performing a nitridation process and a plasma process in an ambient of  $\text{N}_2\text{O}$ . Thus, the Office Action relies upon Tsu et al. for allegedly teaching steps of forming a first ruthenium electrode, performing a nitridation process using an  $\text{NH}_3$  plasma process, depositing a capacitor dielectric film over the first ruthenium electrode, and forming an upper electrode on the capacitor dielectric film.

As a result, the Office Action alleges that “it would have been within the scope to one ordinary skill in the art to combine the teachings of the combination process with Tsu et al. because it would enable the nitridation process of the combination process to be performed and obtain further advantage of providing better oxidation resistance and higher work function than a pure metal electrode (Tsu et al., Col. 6, lines 33-34).” Applicant respectfully disagrees.

Independent claim 1 recites steps of “forming a Ruthenium lower electrode on said internal wall of said concave hole,” “performing a  $\text{NH}_3$ -plasma process and a  $\text{N}_2\text{O}$ -plasma process sequentially on said Ruthenium lower electrode,” and “forming a BST dielectric film on said Ruthenium lower electrode which had undergone said  $\text{NH}_3$ -plasma process and said  $\text{N}_2\text{O}$ -plasma process.” In contrast to the present invention, Yang et al. teaches (see paragraph [0047]) performing the nitridation process to form a metal oxynitride first barrier layer 250 with a plasma process performed in the ambient of  $\text{N}_2\text{O}$ , and Tsu et al. teaches (see col. 2, lines 33-35 and col. 6, lines 23-25) performing the nitridation process to form a metal nitride conductive layer or a nitride conductive layer. Accordingly, Applicant respectfully submits that Yang et al. teaches forming a dielectric layer 255 on the metal oxynitride first barrier layer 250 and that Tsu et al. teaches (see col. 6, lines 58-65 and FIG. 3F) forming a dielectric layer 16 on the nitride conductive layer 22 of a bottom electrode 12. Thus, Applicant respectfully asserts that neither Yang et al. nor Tsu et al., whether taken singly or combined, a step of “forming a BST dielectric film on said Ruthenium lower electrode which had undergone said  $\text{NH}_3$ -plasma process and said  $\text{N}_2\text{O}$ -plasma process,” as recite by independent claim 1, and hence dependent claims 2-12 and 14-16.

Applicant further asserts that the Office Action does not rely on Okuno et al., Iizuka, Lou and/or Graettinger et al. to remedy the deficiencies of Yang et al. and Tsu et al. Moreover, Applicant respectfully asserts that Okuno et al., Iizuka, Lou and/or Graettinger et al. cannot remedy the deficiencies of Yang et al. and Tsu et al.

As MPEP 2143.03 instructs, “[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).” Accordingly, since the cited references, whether taken singly or combined, do not teach or suggest all the claim limitations, Applicant respectfully asserts that the Office Action has not established a *prima facie* case of obviousness with respect to independent claim 1. If the Office Action is relying upon some other rationale, Applicant traverses such an assertion and requests identification of a reference in support of such rationale, in accordance with MPEP § 2144.03.

Since the Office Action fails to meet the requirements for establishing a *prima facie* case of obviousness as to independent claim 1, claims 1-12 and 14-26 are not obvious. Thus, Applicant respectfully requests that the rejection of independent claim 1, and hence dependent claims 2-12 and 14-16, under 35 U.S.C. § 103(a) be withdrawn.

#### **New Claims 17-20**

Applicant has added new claims 17-20 to further define the invention. Applicant respectfully submits that new claims 17-20 are allowable for at least the reasons set forth above.

#### **CONCLUSION**

In view of the foregoing, Applicant respectfully requests entry of the amendments, reconsideration and the timely allowance of all pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicant’s undersigned representative to expedite prosecution.

If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such as an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

**MORGAN, LEWIS & BOCKIUS LLP**

By: Mary Jane Boswell  
Mary Jane Boswell  
Reg. No. 33,652

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**CUSTOMER NO. 009629**  
**MORGAN, LEWIS & BOCKIUS LLP**  
1111 Pennsylvania Avenue, N.W.  
Washington, D.C. 20004  
(202) 739-3000